Insight into the effect of applied potential on the passive behavior of commercially pure titanium in a simulated proton exchange membrane water electrolysis environment

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Abstract The correlation between applied potentials and the passive films of commercially pure titanium (CP-Ti) in a simulated proton exchange membrane water electrolysis (PEMWE) environment was investigated. In the first passive region, the passive film formed at 1 V exhibited superior overall performance. The values of N_D were positively correlated with the applied potentials. The oxygen vacancy diffusivities were determined to be on the order of 10^{-17} cm^2 s^{-1}. The average valences of the passive films were positively linear with the applied potentials. As further increasing the potential, due to the intense OER and consequent growth, the oxide ratios and average valences of the passive films increased. The corrosion induced by accelerated stress cycle (ASC) tests was slight and crystallographically oriented. After increasing the frequency of potential change, the total Ti oxides were slightly less than those of 2.5 V.

Keywords CP-Ti, PEMWE, Electrochemical passivation, Potential of zero charge, ASC tests, passive film

Reference

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